CLAIMS

What is claimed is:

- 1. A radiation sensor comprising:
 - a substrate;
 - an antenna coupled to the substrate;
 - a thermal detector unit spaced from the antenna and from the substrate;
- a multi-layered conductive lead in contact with the antenna and the thermal detector unit, wherein the conductive lead comprises a superconductive layer in electrical contact with the thermal detector unit and the antenna, and a support layer between the superconductive layer and the substrate.
- 2. The radiation sensor of claim 1 wherein the conductive lead further comprises a buffer layer disposed between the support layer and the superconductive layer
- 3. The radiation sensor of claim 2 wherein the buffer layer is characterized by a thermal conductivity K<0.1 W/cm-K.
- 4. The radiation sensor of claim 2 wherein the buffer layer comprises Yttria stabilized Zirconia.
- 5. The radiation sensor of claim 2 wherein the buffer layer defines a thermal conductivity that is less than one order of magnitude greater than a thermal conductivity defined by the superconductive layer.
- 6. The radiation sensor of claim 5 wherein the buffer layer defines a thermal conductivity that is less than a thermal conductivity defined by the superconductive layer.

- 7. The radiation sensor of claim 1 wherein the superconductive layer is selected from the group consisting of perovskite superconductors.
- 8. In a radiation sensor for measuring incident radiation comprising a substrate defining a cavity, a thermal detector unit disposed above the cavity, an antenna coupled to the substrate, and a conductor in contact with the antenna and the thermal detector unit, the improvement comprising:

the conductor defining a plurality of layers and comprising:

- a superconductive layer;
- a support layer between the superconductive layer and the substrate; and
 - a buffer layer between the support layer and the superconductive layer.
- 9. In a radiation sensor for measuring incident radiation comprising a substrate defining a cavity, a thermal detector unit disposed above the cavity, an antenna coupled to the substrate, and a conductor in contact with the antenna and the thermal detector unit, the improvement comprising:

the conductor defining a multi-layer structure and comprising:

- a support layer adjacent to the substrate;
- a superconductive layer opposite the substrate; and
- a buffer layer between the support layer and the superconductive layer.

10. A method for making a radiation sensor comprising:

defining a cavity within a substrate;

depositing a filler material within the cavity;

depositing a thermal detector unit onto the filler material;

depositing an antenna onto the substrate;

depositing a multi-layer conductive lead to contact the thermal detector unit and the antenna, wherein the multi-layer conductive lead defines a layer of superconductive material; and

conductively bonding a first segment of the conductive lead to the antenna to form an electrically conductive pathway between the superconductive material and the antenna, and a second segment of the conductive lead to the thermal detector unit so as to form an electrically conductive pathway between the superconductive layer and the thermal detector unit.

- 11. The method of claim 10 further comprising removing the filler material.
- 12. The method of claim 10 wherein depositing a thermal detector unit comprises depositing a thermally reactive material over at least a portion of the filler material and delineating edges thereof to define the thermal detector unit.
- 13. The method of claim 10 wherein depositing an antenna onto the substrate comprises depositing a conductive material onto the substrate and delineating edges thereof to define the antenna.

14. The method of claim 10 wherein depositing a multi-layer conductive lead comprises;

depositing a layer of support material to contact the thermal detector unit and the antenna;

depositing a layer of buffer material over at least a portion of the support material;

depositing a layer of superconductive material over at least a portion of the buffer material; and

delineating at least one conductive lead by removing at least one of excess support material, excess buffer material, and excess superconductive material.

- 15. The method of claim 14 wherein depositing a layer of buffer material includes laser depositing with ion beam assist.
- 16. The method of claim 10 for making an array of radiation sensors, wherein defining a cavity within a substrate comprises defining a plurality of cavities within a substrate;

depositing a filler material within the cavity comprises depositing filler material within the plurality of cavities;

depositing a thermal detector unit onto the filler material comprises depositing at least one thermal detector unit onto the filler material within each cavity;

depositing an antenna onto the substrate comprises depositing at least one antenna onto the substrate for each said cavity;

depositing a multi-layer conductive lead to contact the thermal detector unit and the antenna comprises depositing a plurality of conductive leads, each conductive lead contacting one thermal detector unit and one antenna; and

conductively bonding comprises bonding a first and second segment of each conductive lead to one of an antenna and a thermal detector unit.